Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436, and further in view of Nagamine *et al.*, U.S. Patent No. 5,932,373 (hereinafter "Nagamine").

Claims 7, 10 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436, and further in view of Yoon *et al.*, U.S. Patent No. 6,218,050 (hereinafter "Yoon").

Claims 8 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436 and further in view of Sonobe *et al.*, U.S. Patent No. 5,527,643 (hereinafter "Sonobe '643") and Lu *et al.*, "Anodic Performance of Vapor-Derived Carbon Filaments in Lithium-Ion Secondary Battery," Carbon, Vol. 39, pp. 493-496 (2001) (hereinafter "Lu").

Applicants respectfully traverse the above rejections.

The Examiner asserts that the present application is obvious in light of the above cited references, as indicated on pages 2-8 of the Office Action dated April 15, 2010 and the Advisory Action (item 11) dated July 28, 2010.

Based on the following, Applicants contend that the Examiner's position is not supportable, thereby making the presently claimed invention unobvious over the cited references.

Applicants respectfully request that the Examiner reconsider the comments made within the responses dated July 15, 2010 and December 11, 2009 (both herein incorporated by reference) in view of the following remarks.

For the Examiner's consideration, Applicants enclose as an exhibit, a 37 C.F.R. § 1.132 Declaration from Dr. Naohiro SONOBE, one of the inventors of the present application.

Applicants submit that the substance of the Examiner's rejection is believed to be based on the conclusion that Claims 1-3 and 6-13 are unpatentable over Kwon in view of the secondary

references and, particularly that Kwon discloses spherical carbon particles substantially satisfying the morphological limitations recited in Claim 1 of the presently claimed invention.

Further, with regard to the Advisory Action dated July 28, 2010, the Examiner was not convinced of the calculations of the particle size disperse factor D4/D, of the Kwon reference particles submitted within Applicants' Response dated July 15, 2010.

In order to further distinguish the presently claimed invention over the cited references, while noting the Examiner's concerns expressed within the Advisory Action, Dr. SONOBE provides within his Declaration the re-submission of the calculation of a particle size disperse factor, D4/D, of the Kwon reference particles. Dr. SONOBE also provides an experimental report for substantially reproducing Example 1 of the presently claimed invention.

The experimental report shows the procurement of spherical carbon particles of the presently claimed invention in order to provide a SEM (scanning electron microscope) picture showing the spherical carbon particle's morphological characteristics so that they can be compared with those of the Kwon reference.

In addition to the calculation of a particle size disperse factor, D4/D, Applicants note that for the calculations, Dr. SONOBE has attached to the Declaration copies of the following two references:

Reference 1: M.W. Wedd: "Determination of Particle Size Distributions Using Laser Diffraction," (http://erpt.org/032Q/Wedd-00.htm), and

Reference 2: (http://chemeurope.com.artcles/*e/61205/).*

References 1 and 2 both show that using laser diffraction is a dominant method of choice within the art for determining particle size distributions, and that the output from laser beam diffraction instruments is usually reported as a volume-basis distribution (rather than a number-

basis distribution) for respective sizes. This is discussed in the paragraph bridging pages 2 and 3 of Reference 1, and corroborated by Figs. 4 and 6 of Reference 2.

In view of such a trend and the wide particle size range (of 0.01 μm to 100 μm) which is shown in Fig. 4 of the Kwon reference, and also a characteristic of the laser diffraction method, Applicants respectfully submit that it is reasonable to believe that the particle size distribution shown in Fig. 4 is on a volume-basis, unless there a special remark contrary to the usual expression of the data.

Moreover, the number-basis frequency (nD) of the Kwon product provides a peak of frequency at a much smaller particle size than 16 μm as now shown in Kwon, Fig. 4, in view of abundance in number of 3−4 μm particles shown in Kwon, Fig. 3 (a SEM picture), which corresponds to the graph of Kwon, Fig. 4.

The measured vertical lengths based on the above, and calculated data of nD^3, nD, n and nD^4 based thereon, are inclusively shown in Table A of the Declaration.

Incidentally, from the thus-obtained data of volume-basis frequency nD^3 at corresponding size D, nD, n and nD^4 required for calculating D4/D1 are calculated as follows:

$nD = nD^3/D^2$, $n = nD^3/D^3$ and $nD^4 = nD^3 \times D$.

Table A also shows calculated $\sum nD^3$, $\sum nD$, $\sum n$ and $\sum nD^4$, and also $D_1 = \sum nD/\sum n$, $D_4 = \sum nD^4/\sum nD^3$ and D_4/D_1 , calculated based thereon. These calculations were performed by using Microsoft Excel (Microsoft Co.). Table A is a print-out of Excel data output.

Applicants note that Table A shows a calculated particle size disperse factor D_4/D_1 of 7.05, which is <u>much larger</u> than the upper limit of 3.0 recited in Claim 1 of the of the presently claimed invention.

As noted previously, Kwon, Fig. 4, lacks frequency data at a particle size of 1.625 μm, and it is regarded as 0 mm in Table A. Dr. SONOBE also attached Table B which was obtained

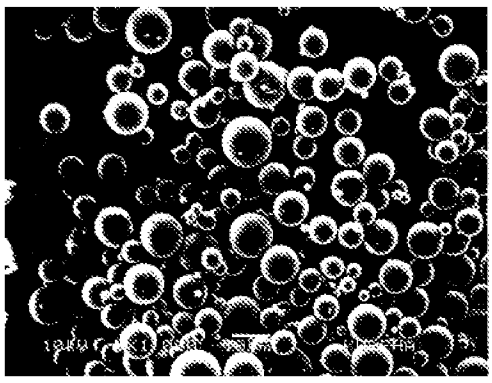
by regarding the frequency data at 1.625 μm as 7 mm by the interpolation between (substantially identical to) those at 1.5 μm and 1.75 μm. Therefore, Table B shows a substantially identical particle size disperse factor D_4/D_1 of 7.04.

Regarding Experiment 1 of the Declaration, the polymerization process for Example 1 of the instant application was substantially repeated. As a result, true-spherical vinyl resin particles having an average particle size (Dv_{50}) of about 15 μm were obtained.

40 g of the thus-obtained true-spherical vinyl resin particles were spread in a small thickness in a stainless steel vat and subjected to 1 hour of oxidation at 280 °C in a muffle furnace to form a spherical carbon precursor. The spherical carbon precursor in an amount of 30 g was charged on a dispersion plate, placed in a quartz-made vertical tubular furnace, and nitrogen was blown upwards in the furnace to form a fluidized bed of the carbon precursor, which was then heat-treated for 1 hour to form a preliminarily calcined carbon.

The calcined carbon was then placed in a horizontal tubular furnace, heated to 1200 °C in a nitrogen atmosphere and retained for 1 hour for main calcination, followed by cooling to form spherical carbon particles having an average particle size of 11 μm.

A sample of the thus-obtained spherical carbon particles were observed through a SEM ("JSM-5510LV", made by JEOL Ltd.) at a magnification of 1000x at an acceleration voltage of 10 kV and photographed. A copy of the resultant photograph is attached to the Declaration as Photo C (at a print-out magnification of about 2000) and is reproduced below:



The above photo shows that the resultant carbon particles are much more spherical than those shown in Figs. 1 – 3 and 7 of the Kwon reference.

About 0.1g of the remaining spherical carbon particles was subjected to measurement of particle size distribution in a particle size range of 0.5 − 3000 μm by using a particle size distribution meter ("SALD-3000S," made by Shimadzu Corporation), similarly as described in paragraph [0047] of the present specification. Data is included within the Declaration as Sheet D together with Sheet Da, which includes some English denotations.

From the particle size distribution data shown on Sheet D, data for calculating a particle size disperse factor as shown in Table A were gathered to provide Table E of the Declaration. The data was gathered as was performed for Table A.

Applicants note that differential frequency value "q3(%)" on Sheet D corresponds to "nD3" in Table E.

The thus-obtained Table E shows a particle size disperse factor D_4/D_1 of 1.24 which is much smaller than the 7.05 value for Kwon shown in Table A.

Applicants submit that the above discussed experimental results, as well as the data shown in Table 1 of the present specification, are believed to show that the spherical carbon particles obtained by the presently claimed invention are much more spherical than and have a remarkably narrower particle size distribution as compared with the carbon particles of the Kwon reference.

Applicants submit that such a broad particle size distribution and a lower sphericity of carbon particles as found in the Kwon reference are understandable based on its production process.

That is, Kwon's process (*e.g.*, as recited in claim 7 or 8) includes step a), heat-treating a mixture of a carbon precursor (such as a resin or pitch) and a dispersion media (hydrophobic

inorganic substance or silicone oil) at a glass transition temperature or softening temperature of the carbon precursor to 300 °C to make the carbon precursor spherical.

The Kwon carbon precursor is in a solid powder form that can be mixed with a dispersion media, *i.e.*, a hydrophobic inorganic substance or silicone oil (see Kwon, page 11, lines 18 - 20). The hydrophobic inorganic substance or silicone oil is distributed on the surfaces of carbon precursor particles to restrain the cohesion of carbon precursor particles and provides a high surface tension to make the particles convert into spherical form (see Kwon, page 8, lines 2 - 24).

This solid powder-form (volume-basis) distribution is considered to determine the particle size distribution of the product carbon particles since the cohesion of the particles is prevented thereafter.

Additionally, the Kwon reference adopts pulverization as means for converting the carbon precursor into a solid powder form for pitch in Example 12 and for phenolic resin in Example 14 (see Kwon, pages 12 - 15).

As is already admitted by Kwon *per se*, pulverized solid particles (not only of carbon) have non-spherical irregular shapes (see Kwon, page 7, lines 16 - 21; page 7, lines 19 - 21). The pulverization is also well known to result in a powder having a broad particle size distribution.

The adoption of solid pulverization for providing carbon precursor particles in Kwon is thus a reason for providing product carbon particle having an inevitably broad particle size distribution and lower sphericity.

In comparison, the carbon precursor particles of the presently claimed invention are spherical vinyl resin particles obtained through suspension polymerization, wherein a vinyl monomer in an easily dispersible and deformable liquid state is subjected to a uniform stirring shearing force. This results in fine spherical droplets having a narrow size distribution. The

resultant uniformly dispersed droplets are solidified into the solid vinyl resin particles while retaining their spherical shape and uniform size distribution.

Applicants submit that this is the reason why the spherical carbon electrode material of the presently claimed invention retains a very narrow particle size distribution as represented by a particle size disperse factor D_4/D_1 of at most 3.0 as recited in the independent claims, and 1.23 − 1.33 in Examples 1 − 10 of the present specification.

Therefore based on the Declaration by Dr. SONOBE and the remarks above, the Kwon reference does not teach or suggest the presently claimed invention.

Applicants submit that based on the above discussion, the Examiner has not resolved the factors, such as ascertaining the differences between the prior art and the claims that are at issue, that are described in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). As indicated in MPEP § 2143, the Examiner must resolve these factors, which provides the controlling framework for an obviousness analysis, before utilizing the rationales that were established in *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

Therefore the rationales the Examiner provides for the rejections are improper.

Applicants note that although the above comments discuss the Kwon reference, this was only for discussing this reference in terms of the *Graham* factor analysis. Applicants submit that taking the above *Graham* analysis in mind, the combination of Kwon with the above cited references do not lead to the presently claimed invention.

In light of the above remarks and enclosed Declaration, Applicants submit that the assertions made by the Examiner regarding the cited references are incorrect, thus failing to support the Examiner's position for each rejection. Accordingly, based on the differences between the presently claimed invention and the above references, they do not teach or suggest the presently claimed invention.

Regarding the secondary references, Sonobe '255, Sonobe '436, Nagamine, Yoon, Sonobe '643 and Lu, these references fail to remedy the deficiencies of Kwon, outlined above.

Since claims 1, 12 and 13 are not obvious to one of ordinary skill in the art, claims 2, 3 and 6-11, which ultimately depend from claim 1, are unobvious over the cited references for the same reasoning discussed above.

Applicants respectfully request reconsideration and withdrawal of the above rejections.

Conclusion

Applicants respectfully submit that all of the rejections raised by the Examiner have been overcome, and that the present application now stands in condition for allowance.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact Paul D. Pyla at the telephone number below, in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 23-0975 for any additional fees required under 37 C.F.R. §§1.16 or 1.17.

Respectfully submitted,

Naohiro SONOBE et al.

By /Paul D. Pyla/ Digitally signed by /Paul D. Pyla/ DN: cn=/Paul D. Pyla/, o, ou, email=ppyla@wenderoth.com, c=US Date: 2010.11.23 12:16:18 -05'00'

Paul D. Pyla
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Attorney for Applicants

Attachment: Exhibit: 37 C.F.R. § 1.132 Declaration from Dr. Naohiro SONOBE

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